

IN THE U.S. PATENT AND TRADEMARK OFFICE

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In re Application of: KLINER, et al.)

Serial Number: 09/778,329)

Examiner: HOFFMANN, J.M.

Filed: 02/06/02)

Group Art Unit: 1731

FOR: PREFORM FOR PRODUCING)

AN OPTICAL FIBER AND METHOD)

THEREFOR)

Attorney Docket Number: SD-8317)
.....

Commissioner for Patents
Alexandria, VA 22313-1450

PRELIMINARY AMENDMENT UNDER 37 C.F.R. §1.115

Sir:

Applicant, through his representative, respectfully submit the following amendment and remarks in a DIVISIONAL of application serial number 09/778,329.

INTRODUCTORY COMMENTS

IN THE CLAIMS

Original claims 1 – 59 are pending in the application for patent. Claims 1 – 52 are withdrawn and canceled without prejudice. Claims 53 – 59 remain pending in the present application. As required by 37 CFR §1.121 a listing of the current status of each claim is listed in a separate section of this paper.

IN THE SPECIFICATION

As required by 37 CFR §1.121(b)(iii), a separate section is attached to this paper that includes pages entitled "Amendments to the SPECIFICATION", in which the changes made to each of the amended PARAGRAPHS is shown. Instructions for amending the Specification are provided below.

In the first line of the application AFTER the TITLE a NEW SECTION entitled "Cross Reference to Related Applications" is introduced. The new section is shown in the attached paper

At page 1 please DELETE the PARAGRAPH beginning on line 14 with the words "The simplest method of preform fabrication " and REPLACE that paragraph with the REPLACEMENT PARAGRAPH shown in the attached paper.

At page 1 please DELETE the PARAGRAPH beginning on line 26 with the words "In order to practice the rod-in-tube ..." and REPLACE that paragraph with the REPLACEMENT PARAGRAPH shown in the attached paper.

At page 6 please DELETE the PARAGRAPH beginning on line 4 with the words "A further another object ..." and REPLACE that paragraph with the REPLACEMENT PARAGRAPH shown in the attached paper.

At page 6, please DELETE the PARAGRAPH beginning on line 7 with the words "Still another object of the invention ..." and REPLACE that paragraph with the REPLACEMENT PARAGRAPH shown in the attached paper.

At page 6, please DELETE the PARAGRAPH beginning at line 14 with the words "Yet another object of the invention ..." and REPLACE that paragraph with the REPLACEMENT PARAGRAPH shown in the attached paper.

At page 13, please DELETE the PARAGRAPH beginning at line 24 with the words "With the present invention, the design " and REPLACE that paragraph with the REPLACEMENT PARAGRAPH shown in the attached paper.

At page 21, please DELETE the PARAGRAPH beginning at line 7 with the words "As shown in FIGURE 10..." and REPLACE that paragraph with the REPLACEMENT PARAGRAPH shown in the attached paper.

At page 21, please DELETE the PARAGRAPH beginning at line 19 with the words "Finally, those skilled in the art " and REPLACE that paragraph with the REPLACEMENT PARAGRAPH shown in the attached paper.

At page 21, please DELETE the PARAGRAPH beginning at line 26 with the words "FIGURE 11 shows the next stage " and REPLACE that paragraph with the REPLACEMENT PARAGRAPH shown in the attached paper.

At page 25, please DELETE the PARAGRAPH beginning at line 20 with the words "However, by simply collecting " and REPLACE that paragraph with the REPLACEMENT PARAGRAPH shown in the attached paper.

AMENDMENTS TO THE SPECIFICATION

ON PAGE 1

IN THE FIRST LINE OF THE APPLICATION PLEASE ADD A NEW SECTION TITLED "RELATED APPLICATIONS" WITH THE FOLLOWING:

CROSS REFERENCE TO RELATED APPLICATIONS

This application is a division of, and claims priority to, co-pending prior U.S. Patent Application Serial Number 09/778,329 originally filed 02/06/2001 entitled "PREFORM FOR PRODUCING AN OPTICAL FIBER AND METHOD THEREFOR."

ON PAGE 1

AT ORIGINAL LINE 14 OF THE SPECIFICATION, IN THE PARAGRAPH BEGINNING WITH THE WORDS "The simplest method of preform fabrication " AND ENDING WITH THE WORDS "...replaced the rod-in-tube technique." PLEASE AMEND THE SPECIFICATION AS FOLLOWS:

The simplest method of preform fabrication is the so-called "rod-in-tube" method such as is disclosed and described in patent serial numbers 4,668,263 and 4,264,347. A rod of glass that will form the core of the fiber is inserted into a thick-walled tube that will become the cladding, and the two are fused together at high temperature. The relative dimensions of the core and cladding in the drawn fiber are identical to that of the original preform. The main advantage of the rod-in-tube technique is its simplicity and as such it was used almost exclusively during the earliest years of fiber development. However, while simple, this technique was also quite limited in its ability to implement optical fiber designs having any but the most rudimentary characteristics, ~~and a~~ Newer methods capable of producing ultra-low-loss fibers, such as are required for optical telecommunications, have essentially replaced the rod-in-tube technique.

ON PAGE 1 AND CONTINUING TO PAGE 2

AT ORIGINAL LINE 26 OF THE SPECIFICATION, IN THE PARAGRAPH BEGINNING WITH THE WORDS "In order to practice the rod-in-tube " AND ENDING ON PAGE 2 WITH THE WORDS "...most notably transition metals." PLEASE AMEND THE SPECIFICATION AS FOLLOWS:

In order to practice the rod-in-tube method, bulk glass is usually synthesized by mixing together the various ingredients in powder form and melting the mixture in a high-temperature furnace. All modern preform fabrication methods, however, are based instead on vapor-deposition techniques. The core and cladding materials are formed by reacting various gas-phase precursors at high temperature to form a glass "soot" that is subsequently sintered into a solid material. A principle advantage of the vapor-deposition process is its inherent capacity for providing a built-in purification step that immediately precedes the synthesis step. Starting reagents (liquids or solids) are heated and delivered to a reaction zone as a vapor phase. This distillation-like process leaves behind the vast majority of contaminating species typically present as trace constituents in the starting reagent materials, most notably transition metals.

ON PAGE 6

AT ORIGINAL LINE 4 OF THE SPECIFICATION, IN THE PARAGRAPH BEGINNING WITH THE WORDS "A further another object " AND ENDING WITH THE WORDS "...central core region" PLEASE AMEND THE SPECIFICATION AS FOLLOWS:

A further ~~another~~ object of this invention is to provide a glass preform for use in fabricating a multimode optical fiber having a non-uniform dopant distribution within a central core region.

ON PAGE 6

AT ORIGINAL LINE 7 OF THE SPECIFICATION, IN THE PARAGRAPH BEGINNING WITH THE WORDS "Still another object of the invention " AND ENDING WITH THE WORDS "...forgoing characteristics" PLEASE AMEND THE SPECIFICATION AS FOLLOWS:

Still another object of the invention is to provide a glass preform for use in fabricating

a polarization-maintaining optical fiber, and for providing such a fiber exhibiting any or all of the ~~forgoing~~foregoing characteristics

ON PAGE 6

AT ORIGINAL LINE 14 OF THE SPECIFICATION, IN THE PARAGRAPH BEGINNING WITH THE WORDS "Yet another object of the invention " AND ENDING WITH THE WORDS "...properties and characteristics." PLEASE AMEND THE SPECIFICATION AS FOLLOWS:

Yet another object of the invention is to provide a glass preform for fabricating optical fibers having any combination of the ~~forgoing~~foregoing properties and characteristics.

ON PAGE 13 AND CONTINUING TO PAGE 14

AT ORIGINAL LINE 24 OF THE SPECIFICATION, IN THE PARAGRAPH BEGINNING WITH THE WORDS "With the present invention, the design " AND ENDING ON PAGE 14 WITH THE WORDS "...to suit the requirements of the application.)" PLEASE AMEND THE SPECIFICATION AS FOLLOWS:

With the present invention, the design and fabrication of such customized preforms becomes realistic. FIGURE 7 shows a representative preform for a step-index fiber with a cladding-to-core diameter ratio of about 10:3 and wherein the rare-earth dopant is confined to a central region of the core having a diameter about one-half (1/2) that of the core region. (Typical, representative dimensions of these regions would be a 200 μm \varnothing cladding and a 60 μm \varnothing core region, comprising a 15 μm thick annular ring surrounding a 30 μm \varnothing central, rare-earth-doped core zone. Each of these dimensions may be varied, however, to suit the requirements of the application.)

ON PAGE 21

AT ORIGINAL LINE 7 OF THE SPECIFICATION, IN THE PARAGRAPH BEGINNING WITH THE WORDS "As shown in FIGURE 10, " AND ENDING WITH THE WORDS "...placed on its side before" PLEASE AMEND THE SPECIFICATION AS FOLLOWS:

As shown in FIGURE 10, a preform template **1004** delineates the core/cladding

boundary, showing directly which cladding rods should be removed. ~~Perform~~Preform template **1004** can, of course, be modified to improve the ease with which the transfer of rods is accomplished. In particular, the “stepped” central portion of the template can be replaced with a removable plug **1005** that allows the user to partially displace the desired rods, as shown. Plug **1005** then would be removed, and the displaced volume in the ~~perform~~preform bundle would be “back-filled” through the hole left behind by the plug with new glass rods having the desired property (e.g., core rods). This procedure, therefore, prevents the cladding rods from inadvertently moving during the replacement process because the core region of the preform always contains substantially the same volume of glass rods as core rods **1003** are displaced. ~~contained within tube **1004** would be placed on its side before~~

ON PAGE 21

AT ORIGINAL LINE 19 OF THE SPECIFICATION, IN THE PARAGRAPH BEGINNING WITH THE WORDS “Finally, those skilled in the art ” AND ENDING WITH THE WORDS “...to the finished perform” PLEASE AMEND THE SPECIFICATION AS FOLLOWS:

Finally, those skilled in the art will appreciate that preform template **1004** can comprise any number of distinct regions, or plugs, having a variety of shapes, sizes, and locations (e.g., for the stress elements described in the context of PM fibers). This approach thus provides a simple method for assembling a preform bundle, with wide flexibility in the range and complexity of physical structures and chemical properties imparted to the finished ~~perform~~preform.

ON PAGE 21 AND CONTINUING TO PAGE 22

AT ORIGINAL LINE 26 OF THE SPECIFICATION, IN THE PARAGRAPH BEGINNING WITH THE WORDS “FIGURE **11** SHOWS THE NEXT STAGE ” AND ENDING ON PAGE 22 WITH THE WORDS “...AN AMPULE **1200** AS SHOWN IN FIGURE **12.**” PLEASE AMEND THE SPECIFICATION AS FOLLOWS:

FIGURE **11** shows the next stage of processing. Bundle **1000** is transferred into a second cladding tube **1100** in which it is suspended and immobilized between two

plugs, e.g., of fiberglass wool **1105** (ultra-high purity silica, available commercially). Fiberglass packing **1105** prevents the bundle from sliding in cladding tube **1100** and ensures that there is no relative movement of rods within bundle **1000**. This second cladding tube **1100** is fabricated with an inner lip or waist **1101** (formed by partial collapse of the cladding tube under vacuum) to provide mechanical support of the above assembly. Because the fiberglass plug is porous, the entire assembly can be cleaned and dried in place, without any need to handle the bundle directly, thereby preventing contamination. The cleaning and drying steps would likely involve both liquid-phase and gas-phase processes, similar to those used with the MCVD method. The cleaned and dried assembly is then evacuated and the cladding tube sealed off at both ends to form an ampule **1200** as shown in FIGURE 12.

ON PAGE 25

AT ORIGINAL LINE 20 OF THE SPECIFICATION, IN THE PARAGRAPH BEGINNING WITH THE WORDS "HOWEVER, BY SIMPLY COLLECTING " AND ENDING WITH THE WORDS "...AND THE AMPULE WOULD BE SEALED." PLEASE AMEND THE SPECIFICATION AS FOLLOWS:

However, by simply collecting the oxide soots of individual reactant species generated in separate reaction processes in the glass ampule *by weight*, it is far more likely that a final target glass composition can be achieved accurately and reproducibly. This result would be achieved by combusting a single reactant gas stream and determining the incremental weight gain of the ampule as the oxide soot collects on its interior walls until a target weight is achieved. The process would be repeated with each subsequent reactant specie until each had been combusted and the desired quantity of its oxide collected. The collected powders would be mixed (e.g. by tumbling them within the ampule), and the ampule would be sealed.

AMENDMENTS TO THE CLAIMS

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52. (currently canceled)

53. (original) A method for providing a plurality of high purity glass rods, comprising the steps of:

providing a source of one or more reactant materials;

heating said reactant materials in the presence of oxygen contained in a flowing gas stream thereby providing one or more oxides of said one or more reactant materials, said oxides forming as a finely dispersed powder;

collecting said oxide powder in a silica ampule;

melting said collected powder and said silica ampule to form a substantially uniform glass boule; and

drawing said boule into one or more glass rods.

54. (original) The method of claim 53, wherein said step of providing includes providing a plurality of reactant materials, and wherein said step of heating includes forming a plurality of oxide powders.

55. (original) The method of claim 53, wherein said step of heating said reactant materials further comprises heating with a tube furnace or with a ring burner.

56. (original) The method of claim 53, wherein said step of collecting further includes collecting a predetermined quantity of said oxide powders by measuring an incremental weight gain of said silica ampule as said powders are collected.

57. (original) The method of claim 53, wherein said reactant materials comprise one or

a combination of halide compounds and chelated complexes.

58. (original) The method of claim 57, wherein said halide compounds and chelated complexes comprise materials selected from the list consisting of boron, aluminum, silicon, phosphorous, sulfur, germanium, selenium, tellurium, iron, zinc, zirconium, titanium, or any of the lanthanide rare earth elements.

59. (original) A high purity glass rod made by the method, comprising the steps of:

forming a plurality of finely dispersed oxide powders by heating one or more reactant materials in the presents of oxygen;

collecting said oxide powders in a clean silica ampule such that said powders are not contaminated by handling;

heating said collected powders and said silica ampule in order to melt said powders and said silica ampule to form a ductile glass boule; and

drawing said ductile glass boule into one or more glass rods.

REMARKS

IN THE SPECIFICATION:

Applicants respectfully note that the specification has been amended in order to correct multiple errors in spelling, punctuation and syntax.

At page 1, in line 21 a comma is ADDED AFTER the word "simple", The change is made to correct the punctuation of the sentence.

At page 1, in line 23, the comma AFTER the word "characteristics" is DELETED and REPLACED with a period, The word "and" following the deleted comma is itself DELETED and a new sentence begun by CAPITALIZING the word "new", The change is made to correct the punctuation and syntax of these sentences.

At page 1, in line 26, the punctuation of the sentence is corrected by ADDING a comma AFTER the word method.

At page 6, in line 4 the word "another" AFTER the word is "further" is DELETED. The change is made to correct the syntax of the sentence.

At page 6, in lines 9 and 15 the SPELLING of the word "forgoing" is CORRECTED to read "foregoing".

At page 14, line 3 the word "dimension" is DELETED and REPLACED with the word --dimensions--. The changes are made to correct the syntax of the sentence.

At page 21, in line 17, the word "contain" AFTER the word "always" is DELETED and REPLACED with the phrase -- contains substantially the same volume of glass --. And the phrase -- as core rods 1003 are displaced --is ADDED AFTER the word "rods" and BEFORE the period ending the sentence. Sentence fragment "contained within tube 1001 would be placed on its side before" is DELETED as superfluous. The change is made to better describe the Applicants' invention. Support is found at page 21, line 5 of the written specification.

At page 22, in line 8 the comma following the word "processes" is DELETED. The change is made to correct the punctuation of that sentence,

At page 25, in line 5, a comma is INSERTED AFTER the italicized words "by weight The change is made to correct the punctuation of that sentence.

No new matter has been added as a result of the forgoing amendments.

CONCLUSION

Applicant respectfully request that original claims 1 – 52 be canceled and assert that original claims 53 – 59 described a unique method that is neither anticipated, suggested nor taught by the prior art. Favorable consideration of claims now presented and allowance of this application is earnestly solicited.

This response is, therefore:

Respectfully submitted by,

SANDIA NATIONAL LABORATORIES


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CERTIFICATION UNDER 37 CFR 1.10

I hereby certify that this New Application Transmittal and the documents referred to as enclosed therein are being deposited with the U. S. Postal Service on **JUNE 25, 2003**, in an envelope as "Express Mail Post Office to Addressee" Mailing Label Number EL177881984US, addressed to: Mail Stop Patent Application, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450

Date of Deposit: 6-25-03


Person Making Deposit

Signature

"Express Mail" Mailing Label No. EL177881984US

Attachments:

Preliminary Amendment including:
Marked Version of Amendments to the SPECIFICATION
Marked Version of Amended CLAIMS
PTO SB/05 Transmittal Letter
PTO SB/17 Fee Transmittal / Copy
Return Receipt Postcard